REMARKS

All of the outstanding claims were rejected under 35 USC 112, first paragraph. The Examiner's remarks, however, address only claims 1 and 44. Applicants conclude that all of the claims other than claims 1 and 44 are rejected under 35 USC 112, first paragraph, for being *dependent* on claims 1 and 44.

With respect to claim 1, the Examiner asserts that the receiver specified in the claim is not , described in the specification in such a way as to enable one skilled in the art to which it pertains to make and/or use the invention. In particular, the Examiner states

> To be more specific, the receiver as claimed (Figure 3) was briefly described on page 6, lines 1-11 of the disclosure without further explanation as to how the receiver is consisted of and how the receiver is operated to carry out the claimed invention. And the synchronization signal as claimed was described on page 19, lines 18-23 of the disclosure, which requires the averaging of the phase difference between each tone pair to arrive at an overall phase estimate to derive the overall synchronization signal.

The first sentence is clear, but the second sentence is not. The undersigned called Examiner Hsu, on Jun 7, 2004 and the Examiner kindly explained that the Examiner felt that there is no reference in the specification as to which element does the synchronization. The Examiner's courtesy is sincerely appreciated.

Although applicants respectfully traverse the rejection, in order to expedite prosecution claim 1 is amended herein. As amended, the claim clearly is supported by the specification, as demonstrated below.

Claim 1 defines a communication system, and the specification clearly addresses an OFDM communication system. A typical communication system comprises a transmitter and a receiver, and so does applicants' communication. Pages 2-5 of the specification describe the general OFDM schema under which the transmitter operates and, necessarily, the receiver must operate correspondingly if it is to receive and recover the information that the transmitter wishes to communicate.

Specifically, in a QPSK OFDM system, the transmitter receives a digital signal at a particular clock rate. Adjacent bits are modulated to form symbols, and the steam of symbols, in blocks, is transformed into frequency bins -- having particular frequencies.

The resulting signals are filtered and sent in analog fashion to a receiver. The transmitted signals is a time domain signal.

The receiver must have a clock to recover the information that is being sent. Ideally, this clock is of a frequency that is exactly the same as the frequency of the transmitter's clock, and the sampling of the received signal ideally occurs precisely at instances that correspond to clock transitions of the transmitter (Taking into account, of course, for the delay of transmission through the transmission channel). Failing to sample the incoming signal at the correct instances and at the correct frequency causes the frequency offsets and timing offsets that the prior art, and the application, address.

All receivers operate on the received signal in stages or, put another way, all receivers can be viewed to consist of stages. It is a seriatim operation where a first processing stage is followed by a second processing stage, and so on. It is not uncommon for the first stage (comprising a number of elements) to be called a "front end" stage, or simply the "front end."

Between line 12 of page 6 and line2 of page 7 applicants clearly set out he problems that prior art receivers had, and the subsequent text points out that prior art efforts have not satisfactorily solved the problems. Clearly, the reader expects that the teaching that follows solves, or at least ameliorates, the problem that the prior art has not been able to solve.

Indeed, the text at page 9, line 4 - page 12, line 12, is clearly devoted to teaching "Timing Offset Correction;" the text that follows, page 12, line 13 - Page 13, line 15, teaches "Frequency Offset Correction;" and the text that follows, page 14, line 13 - page 14, line 12, teaches "Phase Offset Correction." That is, the text between page 12, line 13 and the page 14, line12 teaches what is done (or may be done) within the receiver's front end to overcome or at least ameliorate the problems set forth at the end of page 6 and beginning of page 7.

As for the question of "how the receiver is consisted of and how the receiver is operated to carry out the claimed invention," applicants respectfully direct the Examiner's attention to FIG. 3, and to pages 9 et seq.

Amended claim 1 specifies a receiver with a front end stage and a subsequent stage. With reference to FIG. 3, the following elements constitute the front end stage:

the "I/O input" element, the "Frequency Offset Compensation" element, the "Timing and Frequency Offset Estimation" element, the "Timing Adjustment" element, and the "Windowing" element. Calling the collection of the enumerated elements a "front end" is not unreasonable.

Amended claim 1 specifies that the front end is characterized by the fact that it receives signal, develops related signals, and from those related signals a plurality of modulated carriers are developed. The FIG. 3 preamble clearly creates signals that are applied to the "FFT" element, and that element does create the aforementioned "plurality of modulated carriers.

As to how the receiver is operated, applicants respectfully submit that the specification clearly describes the following.

1. The signal received by the receiver -- in the time domain -- is described by the equation at line 22 of page 9.
2. The transform of this signal is described by the equation at line 1 of page 10.
3. The equation at line 7 of page 10 teaches that the timing offset is related to the difference in phase between adjacent received signal -- in the frequency domain.
4. The described system is a QPSK system, and therefore, it is clear that the equation at page 10, line 5, where N=4, when raised to the 4th power -- as taught at page 11, lines 8 - 9 -- yields $\left(R_n\right)^4 = \left(X_n\right)^4 \cdot e^{j2\pi\Delta t}$. This equation states that the phase of the received signal R_n when raised to the 4th power is $2\pi\Delta t$. From this, and from the equation that follows, it is clear that Δt is equal to the phase of R_n raised to the 4th power subtracted from the phase of R_{n+1} raised to the 4th power. This is also illustrated graphically in FIGS. 6 and 7.
5. Clearly, to develop the Δt signal it is necessary to have the R_n signals, and those can be obtained by processing the received input signal within the element that performs the timing offset estimation, i.e., within the "Timing and Frequency Offset Estimation" element. This can be accomplished by feeding the output of the "Frequency Offset Compensation" element to the "Timing and Frequency Offset Estimation" element, and including in the latter the components, or processing, that is needed. Alternatively, the output of the "windowing" element can be fed to the "Timing and Frequency Offset Estimation" element. Most

advantageously, however, the output of the "FFT" can be fed to the "Timing and Frequency Offset Estimation" element because the "FFT" element already creates the R_n signals. To remove the permitted variability as to which of the possible signals is applied to the "Timing and Frequency Offset Estimation" element, and the possible consequent lack of clarity, FIG. 3 is amended to show that the signal of the "FFT" is applied to the "Timing and Frequency Offset Estimation" element, since that is the most efficient embodiment.

6. To develop the Δf signal, the specification clearly states that it obtained "by calculating the average phase of the ensemble of the received tones, and that the phase of each of the received tones can be obtained by raising each tone to the 4th power. Page 13, lines 6-8.
7. The "Timing and Frequency Offset Estimation" element contains two outputs: one that is applied to the "Frequency Offset Compensation" element, and one that is applied to the "Timing Adjustment" element. Obviously, the output signal that is applied to the "Frequency Offset Compensation" element pertains to frequency-offset Δf adjustment, and the output signal that is applied to the "Timing Adjustment" element pertains to timing-offset Δt adjustment.

Based on the drawing as amended, which describes how the receiver is constituted, and the description (from page 8, line 15 till the end of the specification), which describes the operation of the receiver in accord with the principles of applicants' invention, it is respectfully submitted that the application clearly teaches that the front-end stage receives signals (input to the "I/O Input" element), develops related signals (output of "Windowing" element), employs a plurality of modulated carriers created from a transformation of the related signals into frequency domain (output of the "FFT" element), and employs the offset measure in creating the related signals (e.g., the output of the "Timing Adjustment" element is applied to the "I/O Input" element.

In view of the above, it is respectfully submitted that amended claim 1 is fully supported by the specification, thereby overcoming the 35 USC 112, first paragraph rejection of claim 1-8, 19-21, and 26-35.

Claim 44 was rejected under 35 USC 112, first paragraph, because, according to the Examiner, the steps of

> Developing in said receiver a synchronization signal from computes phases in the frequency domain of said individually modulated carrier; and applying said synchronization signal to synchronize the plurality of modulated carriers that are received by said receiver

are not taught sufficiently. Applicants respectfully traverse, citing the above review of applicants' teachings. Nevertheless, claim 44 is amended herein and, as amended, is believed to be fully supported by the specification and, therefore, in compliance with 35 USC 112, first paragraph.

As amended, claim 44 specifies a steps of

1. receiving in a receiver said plurality of individually modulated carriers,
2. developing in said receiver a synchronizing signal from computed phases in the frequency domain of said individually modulated carriers; and
3. applying said synchronizing signal to a circuit that performs said receiving.

The first step is performed by the FIG. 3 receiver generally, and by the "I/O Input" element in particular. The second step is performed in the "Timing and Frequency Offset Estimation" element in accord with the teachings found at page 10 through page 12, line 12. The third step is performed n the "Timing and Frequency Offset Estimation" element and the "Timing Adjustment" element, applying the output signal of the "Timing Adjustment" element to the "I/O Input" element, which forms the "circuit" of claim 44.

Thus, applicants respectfully submit that amended claim 44 is in compliance with 35 USC 112, first paragraph. Since the Examiner's remarks only address claims 1 and 44, it is respectfully submitted that overcoming the 35 USC 112, first paragraph, rejection relative to claims 1 and 44 also overcomes the rejection relative to the remaining outstanding claims.

Claims 1-8, 19-21, 26-35, 45-50, 53-56 were rejected under 35 USC 112, second paragraph.

The first issue raised by the Examiner relates to claim 1. Amended claim 1 is believed in compliance with 35 USC 112, second paragraph, and that overcomes the rejection.

The second issue raised by the Examiner related to claim 20. Applicants disagree that the word "schema" is inappropriate but, in order to expedite prosecution, the claim is amended as suggested by the Examiner. That overcomes the rejection.

As for the remaining issues raised by the Examiner, claims 26, 45, 46, 49, and 50 are amended and, as amended, are believed to overcome the rejections under 35 USC 112, second paragraph. It is respectfully submitted that overcoming the rejection of the claims relative to which the Examiner offered explicit remarks, also overcomes the rejection of the other claim, which presumably were rejected solely for being dependent on a rejected claim.

In light of the above amendments and remarks, it is respectfully submitted that all of the Examiner's rejections have been overcome. Approval of the amended drawing sheet, reconsideration of the outstanding claims, and allowance are respectfully solicited.

Respectfully,
Bruce Edward McNair
Leonard Joseph Cimini, Jr.

Dated: 6/7/04

By _____
Henry T. Brendzel
Reg. No. 26,844
Phone (973) 467-2025
Fax (973) 467-6589
email brendzel@comcast.net